REMARKS

The present Amendment amends claims 1 and 4-8, and cancels claims 2, 3 and 9. Therefore, the present application has pending claims 1 and 4-8.

Support for Amendments

The Amendment is fully supported by the disclosure. For example, the amendments to the claims are supported by the specification as originally filed on: page 7, lines 19-25; page 4, lines 15-19; page 16, lines 6-14; page 8, lines 20-23; and page 10, lines 8-20.

35 U.S.C. §112 Rejections

Claims 1-9 stand rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is traversed for the following reasons. As previously indicated, claims 2, 3 and 9 are canceled. Applicants submit that claims 1 and 4-8, as now more clearly recited, are in compliance with the provisions of 35 U.S.C. §112.

35 U.S.C. §102 Rejections

Claims 1-9 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 2,930,192 to Johnson ("Johnson"). As previously indicated, claims 2, 3 and 9 were canceled. Therefore, this rejection regarding claims 2, 3 and 9 is rendered moot. Regarding the remaining claims 1-4 and 8, this rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1 and 4-8 are not taught or suggested by Johnson, whether taken individually or in combination with any of the other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims to more clearly describe features of the present invention. Specifically, amendments were made to the claims to more clearly recite that the present invention is directed to a combustor as recited, for example, in independent claim 1.

The present invention, as recited in claim 1, provides a combustor for a regeneration type gas turbine, where combustion air in the gas turbine is compressed by a compressor and is heated using gas turbine exhaust gas in a regeneration heat exchanger. The combustor includes: a tubular combustor liner forming a combustion chamber; an outer tube provided in an outer peripheral portion side of the combustor liner via a gap; a first fuel injecting device provided in one end of the combustor liner and injecting a fuel and an air into the combustion chamber; an air introduction hole introducing the combustion air guided from the gap with respect to the outer tube into the combustion chamber; and a second fuel injecting device provided in the outer tube at a position facing to the air introduction hole and directly injecting the fuel into the combustion chamber from the air introduction hole.

According to the present invention, gas is used as the fuel, and the second fuel injecting device has a fuel injection nozzle having an injection angle such that the fuel reaches an outer edge of an air jet from the air introduction hole when the fuel goes to a center portion in a diametrical direction of the combustor liner along an air jet axis from said air introduction hole.

Also according to the present invention, the air introduction hole and the second fuel injecting device are installed at a position so as to inject the combustion air and the gas fuel to a downstream side of a flame generated by the first fuel injecting device, a flow speed of the combustion air injected into the combustion chamber from the air introduction hole is made higher than a flow speed of a

combustion gas around the air introduction hole, the combustion air injected from the air introduction hole is brought into contact with each other within the combustion chamber so as to form a circulation jet flow, the combustion air and the fuel introduced into the combustion chamber from the air introduction hole is mixed with the combustion gas so as to generate a lean air-fuel mixture, an oxidation reaction of the lean air-fuel mixture is started by the circulation jet flow, and a slow oxidation reaction is performed so as to depend on a diffusion of heat to the lean air-fuel mixture. The prior art does not disclose all of these features.

The above described features of the present invention, as now more clearly recited in the claims, are not taught or suggested by any of the references of record, particularly Johnson, whether taken individually or in combination with any of the other references of record.

Johnson teaches a reverse vortex combustion chamber. However, there is no teaching or suggestion in Johnson of the combustor as recited in claim 1 of the present invention.

One feature of the present invention, as recited in claim 1, includes a combustor for a regeneration type gas turbine, where combustion air in the gas turbine is compressed by a compressor and is heated using gas turbine exhaust gas in a regeneration heat exchanger. Johnson does not disclose this feature.

Although Johnson teaches a gas turbine combustor, the present invention distinguishes over Johnson because the present invention is directed to a "regeneration type gas turbine." In other words, Johnson does not teach or suggest a “combustor for a regeneration type gas turbine, where combustion air in the gas turbine is compressed by a compressor and is heated using gas turbine exhaust gas in a regeneration heat exchanger, in the manner claimed.

Another feature of the present invention, as recited in claim 1, includes where gas is used as the fuel, and the second fuel injecting device has a fuel injection nozzle having an injection angle such that the fuel reaches an outer edge of an air jet from the air introduction hole when the fuel goes to a center portion in a diametrical direction of the combustor liner along an air jet axis from said air introduction hole. Johnson does not disclose this feature.

For example, Johnson does not teach where the fuel is a gas fuel. To the contrary, Johnson discloses where the fuel fed to fuel inlet nozzles 15 and 15' is an oil fuel (i.e., liquid). As described in column 3, lines 60-70, Johnson discloses where its combustor "provides vaporization and gasification of the fuel," and where "The atomized fuel 40' is injected with the air." This is not the same as the present invention where the fuel is gas.

By way of further example, Johnson does not teach or suggest a fuel injection nozzle having an injection angle, in the manner claimed. More specifically, Johnson does not teach or suggest an injection angle of the fuel injected from the "fuel inlet nozzle 15'" (Fig. 2), as claimed.

Yet another feature of the present invention, as recited in claim 1, includes where the air introduction hole and the second fuel injecting device are installed at a position so as to inject the combustion air and the gas fuel to a downstream side of a flame generated by the first fuel injecting device, a flow speed of the combustion air injected into the combustion chamber from the air introduction hole is made higher than a flow speed of a combustion gas around the air introduction hole, the combustion air injected from the air introduction hole is brought into contact with each other within the combustion chamber so as to form a circulation jet flow, the combustion air and the fuel introduced into the combustion chamber from the air

introduction hole is mixed with the combustion gas so as to generate a lean air-fuel mixture, an oxidation reaction of the lean air-fuel mixture is started by the circulation jet flow, and a slow oxidation reaction is performed so as to depend on a diffusion of heat to the lean air-fuel mixture. Johnson does not disclose this feature.

The cited reference does not disclose the matter that "fuel-air mixture 30" (Fig. 2) fed from "the fuel inlet nozzle 15' and the holes 19" is formed as "lean air-fuel mixture".

In the present invention, the lean air-fuel mixture may be used as described in Table 1 of the specification (i.e., "pilot burner equivalent ratio: 0.392" and "secondary burner equivalent ratio: 0.410"). In this case, the equivalent ratio means a rate of "actual air fuel ratio" with respect to "theoretical air fuel ratio" of the fuel, and when the numerical value thereof is less than 1, it means "lean air-fuel mixture".

To the contrary, in Johnson, the fuel is burned in a too rich state in which the equivalent ratio is equal to or more than 1.0 – specifically between 1.2 and 1.5. Further, the oxidation reaction is started at the same time when the "fuel-air mixture 30" is fed into the combustion chamber. Accordingly, Johnson does not teach or suggest where an oxidation reaction of the lean air-fuel mixture is started by the circulation jet flow, and a slow oxidation reaction is performed so as to depend on a diffusion of heat to the lean air-fuel mixture, as in the present invention.

Therefore, Johnson fails to teach or suggest "<u>A combustor for a regeneration type gas turbine, wherein combustion air in the gas turbine is compressed by a compressor and is heated using gas turbine exhaust gas in a regeneration heat exchanger</u>" as recited in claim 1.

Furthermore, Johnson fails to teach or suggest "<u>wherein gas is used as the fuel, and the second fuel injecting device has a fuel injection nozzle having an</u>

injection angle such that the fuel reaches an outer edge of an air jet from the air introduction hole when the fuel goes to a center portion in a diametrical direction of the combustor liner along an air jet axis from said air introduction hole" as recited in claim 1.

Further, Johnson fails to teach or suggest "wherein the air introduction hole and the second fuel injecting device are installed at a position so as to inject the combustion air and the gas fuel to a downstream side of a flame generated by the first fuel injecting device, a flow speed of the combustion air injected into the combustion chamber from the air introduction hole is made higher than a flow speed of a combustion gas around the air introduction hole, the combustion air injected from the air introduction hole is brought into contact with each other within the combustion chamber so as to form a circulation jet flow, the combustion air and the fuel introduced into the combustion chamber from the air introduction hole is mixed with the combustion gas so as to generate a lean air-fuel mixture, an oxidation reaction of the lean air-fuel mixture is started by the circulation jet flow, and a slow oxidation reaction is performed so as to depend on a diffusion of heat to the lean air-fuel mixture" as recited in claim 1.

Therefore, Johnson does not teach or suggest the features of the present invention, as recited in claims 1 and 4-8. Accordingly, reconsideration and withdrawal of the 35 U.S.C. §102(b) rejection of claims 1 and 4-8 as being anticipated by Johnson are respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references used in the rejection of claims 1 and 4-8.

In view of the foregoing amendments and remarks, Applicants submit that claims 1 and 4-8 are in condition for allowance. Accordingly, early allowance of claims 1 and 4-8 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of BRUNDIDGE & STANGER, P.C., Deposit Account No. 50-4888 (referencing Attorney Docket No. ASA-5384).

Respectfully submitted,

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